

Three new species of southern African *Bembix*, a new synonymy, and biological notes on other species of the genus (Hymenoptera: Sphecidae: Nyssoninae)

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ABSTRACT

Three new species of southern African *Bembix*, *B. namibensis* sp. nov., *B. zinni* sp. nov. and *B. karoensis* sp. nov. are described, *B. junodi* Arnold is sunk into synonymy with *B. ulula* Arnold, and biological notes are given for ten other species of *Bembix*. The nature of the prey of the genus *Bembix* with particular reference to Afrotropical species is reviewed and discussed.

INTRODUCTION

An investigation was made of the *Bembix* holdings of the major collections of southern Africa with a view to undertaking a taxonomic revision of the genus in that region. Three undescribed species and one synonymy were discovered. Some other taxonomic problems were identified but due to the inadequacy of the holdings of the relevant species and the consequent need for additional material from specific localities a taxonomic revision was considered to be premature. Consequently the new species and the synonymy only are dealt with in the present paper.

Over the years various biological observations on *Bembix* species have been gathered to-

gether. These are constituted from scattered published records, which in some instances are obscure and therefore generally overlooked, from specimen labels of Albany Museum material, and from personal observations. It is hoped that this represents as nearly as possible a complete compilation of the biological knowledge of *Bembix* in the Afrotropical Region and that it will as such form a foundation on which to build.

DESCRIPTIONS AND SYNONYMY

Bembix namibensis sp. nov.

MALE (Figs 1–8)

Black; mandibles excepting their apices, labrum, clypeus, face up to level of anterior ocellus (excepting for a pair of elongate wedge-shaped spots above antennal sockets), narrow bands widening below margining posterior orbits, scapes and flagella excepting broad dorsal black streaks, posterior margin and sides of pronotum, narrow streaks on mesonotum margining tegulae, anterior halves of tegulae themselves, bands margining scutellum and metanotum behind, anterior aspect of mesopleura and small marks on same behind pronotal lobes, mesosternum anteriorly and also along midline and adjacent to coxae, streaks on metapleura, markings of variable extent on sides of propodeum and including spiracular lobe, broad transverse bands on tergites 1–5, large central spot on tergite 6, visible part of gonostyles, sternites 1 and 2 at base and postero-lateral corners of sternites 1–5, legs (except black inner aspect of fore-femora and black streaks on foretibiae, inner aspect of femora and to a lesser extent of tibiae of middle and hind legs, comb on first tarsomere and distal extremities of all five tarsomeres of each fore-leg, claws and pulvilli of all legs), *various shades of yellow*.

Markings on tergites (except on lateral margins) almost white, markings on head pale yellow, those on thorax, legs, lateral margins of tergites and also the sternites darker yellow.

Extreme tip of tergite 7, centres of sternites 1 and 2 (and on the latter the raised projection), extreme margin of sternite 6 and whole of sternite 7, inner aspect of femora and to a lesser extent of tibiae of middle and hind legs, *light ferruginous*.

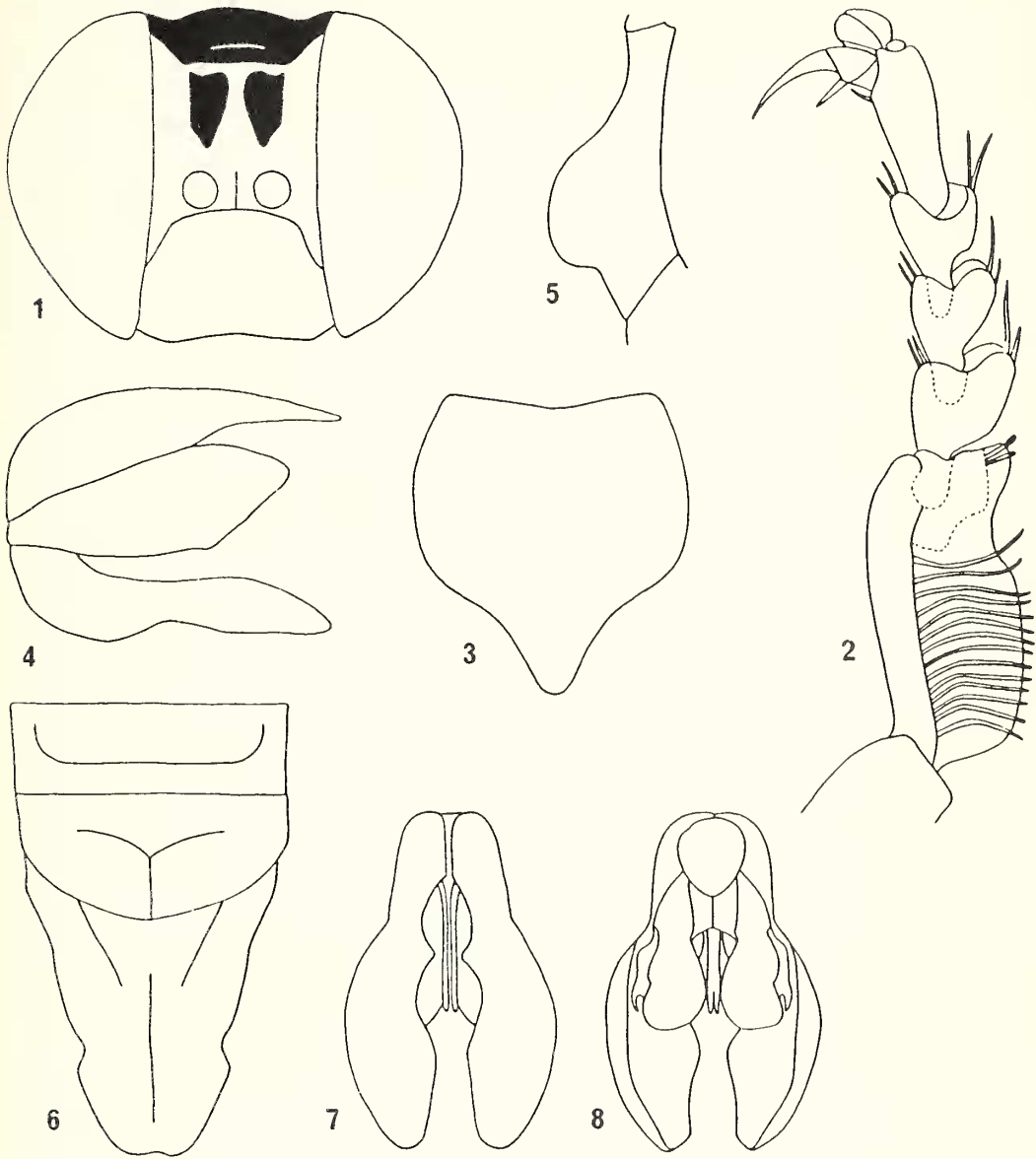
Wings absolutely clear; subcosta to junction with basal vein black, other veins brown (light brown proximally, darker brown distally).

Length of body 17–20 mm, length of wings 12–13 mm, hamuli 33–35.

Clypeus baso-laterally, face, occiput and back of head, thorax, propodeum, tergite 1 on declivous face and sternite 1 clothed with white pilosity, sparse everywhere except on mesopleura below and on mesosternum where dense; vestiture otherwise composed of short, decumbent, white pubescence, dense on clypeus and inner orbits below where shining, sparse elsewhere and apparently absent on propodeum above.

Punctuation generally fine and close; propodeum with somewhat coarser punctures; tergite 7 with large sparse punctures separated by wide shining interstices.

Mandibles lightly built, gracile, with the exception of a small tooth some way back from the apex tapering evenly to tip. Clypeus narrow, strongly convex; face narrow, at level of antennal sockets only very lightly wider than width of one eye, bluntly carinate below between antennal sockets (this carina carried over onto base of clypeus). Eyes slightly divergent below (Fig. 1). Scape robust, less than twice as long (excluding radicle) as maximum width. Flagellum with flagellomere 1 as long as 2, 3 and half of 4 together; flagellomeres 3–6 finely carinate be-



Figs 1-8. *Bembix namibensis* sp. nov. ♂: 1, head (frontal view); 2, right fore tarsus; 3, tergite 7 (dorsal view); 4, abdominal segment 7 (lateral view); 5, sternite 2 (lateral view, profile, anterior to top of figure); 6, sternites 5, 6 and 7 (ventral view); 7, genitalia (dorsal view); 8, genitalia (ventral view). (Figs 1, 3-8 are $\times 12$; Fig. 2 is $\times 25$).

low, 5 and 6 partially and 7–11 completely excavate below, 7–11 becoming progressively and strikingly larger (last flagellomere equal in length to pedicel and flagellomere 1 together).

Fore tarsi (Fig. 2) strikingly modified; first tarsomere greatly and evenly expanded laterally on one side into a thin, transparent lamella partially covered on the upper surface by fine concolourous pilosity and furnished apically beneath with an acutely pointed projection on the inner side and a pair of short flattened setae on the outer. Arising from the basic shaft of the first tarsomere but on its lower surface are two combs of greatly differing character: the first composed of 16 coarse, long, curved, parallel spines lies immediately beneath the lamella and in the same plane as the latter, the apices of the spines just exceeding the lateral margin of the lamella; the second comb composed of about an equal number (that is 16) of long, fine, curved hairs lies in a plane at right angles to the first. Tarsomeres 2, 3 and 4 also expanded but less so than 1; each (like 1) apically beneath with an acutely pointed projection on inner side and a pair of setae on the outer (these setae, however, longer, finer and not flattened).

Middle femora with posterior margin sharply angled, almost carinate, slightly undulate but not serrate nor anywhere toothed; middle tarsi modified.

Tergite 7 (Fig. 3) markedly narrowed over apical third, narrowly rounded apically, with lateral lobes (Fig. 4) broad (broadest at level where dorsal portion abruptly narrows) and coming to a point apically.

Sternite 2 (Fig. 5) with a large, raised, longitudinal, lamelliform projection on middle of disc, rising moderately steeply but smoothly anteriorly and falling in a smooth arc that is a quarter circle posteriorly. Sternites 4–7 modified (Fig. 6): 4 with a weak, hardly raised transverse line on middle of disc in posterior half; 5 with a posteriorly raised transverse platform over greater part of disc (margins of platform raised and carinate particularly at evenly rounded postero-lateral corners); 6 with a posteriorly raised very obtusely pointed triangular platform on centre of disc; 7 broadly rounded apically and with a single, weak, median carina.

Genitalia as figured (Figs 7 and 8).

FEMALE unknown.

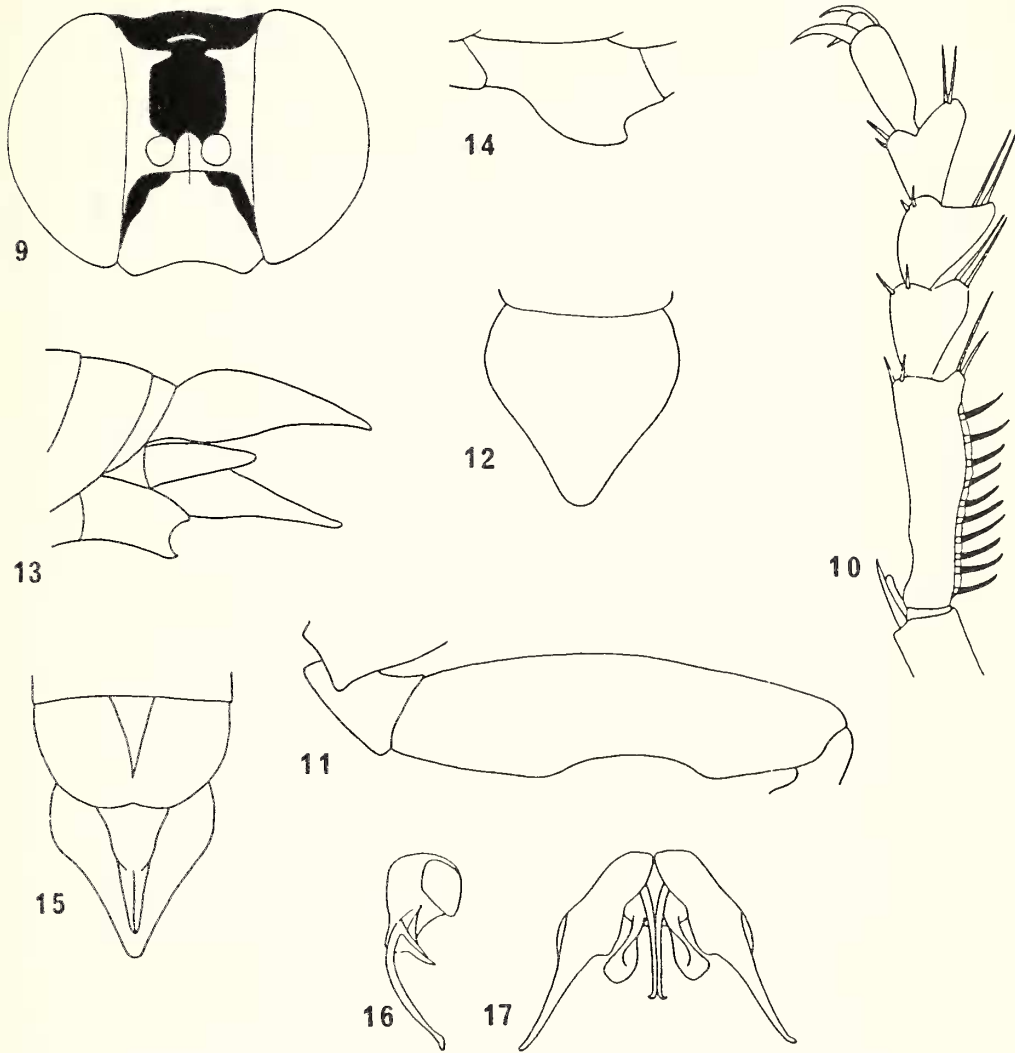
MATERIAL EXAMINED: South West Africa (Namibia): Namib Plain, 15 m. E Natab, 29.iv.1969 (H. D. Brown), Holotype ♂, Paratype ♂ (Albany Museum); Awasib Mains, Diamond Area No. 2, 14.v.1969 (H. D. Brown), Paratype ♂ (National Collection of Insects).

ETYMOLOGY: The name, an adjective, is derived from the geographical name, Namib, and refers to the provenance of the described specimens.

Bembix zinni sp. nov.

MALE (Figs 9–17)

Black; mandibles excepting their apices, labrum, clypeus (excepting for a pair of narrow triangular markings bordering sides and part of base (Fig. 9)), face below and between antennal sockets, broad bands margining inner orbits to level of anterior ocellus, narrow bands widening below margining posterior orbits (but not meeting in the middle behind ocellar area as is the case in female), underside of scapes, posterior margin and sides of pronotum, narrow margins on mesonotum bordering tegulae, bands margining scutellum and metanotum behind, anterior aspect of mesopleura and backwardly curved vertical streaks on middle of same, most of metapleura, a pair of converging streaks on propodeum above and on declivity, sides of propodeum



Figs 9–17. *Bembix zinni* sp. nov. ♂: 9, head (frontal view); 10, right fore tarsus; 11, left hind femur; 12, tergite 7 (dorsal view); 13, end of abdomen (lateral view); 14, sternite 2 (lateral view, profile, anterior to left of figure); 15, sternites 6 and 7 (ventral view); 16, gonostyle (lateral view); 17, genitalia (dorsal view). (Figs 9, 11–17 are $\times 12$; Fig. 10 is $\times 25$).

(except posterior to spiracles) and posterior angles, transverse bands on tergites 1–4 or 5, entire tergite 6 (and sometimes 5), posterior half of tergite 7 (sometimes the entire exposed portion), sternite 1 (except for a pair of lateral spots), distal two-thirds of sternite 2, entire sternite 3, sides and posterior margin of sternite 4, posterior corners of sternite 5 and narrow lateral margins on sternite 6, legs (except for spots on coxae and trochanters, pulvilli), *light coloured*.

Markings on tergites 1–5 (except on lateral margins) almost *white*; markings on head and thoracic dorsum *pale yellow*; rest of thorax and abdomen as well as legs *darker yellow*; tergites 6 and 7 *orange yellow to light ferruginous*. Flagellum dark ferruginous above, lighter below, lanceolate spines on first tarsomere of each fore-leg *ferruginous*.

Wings absolutely clear; subcosta to junction with basal vein black, other veins brown (light brown proximally, darker brown distally).

Length of body 13–14 mm, length of wings 9 mm, hamuli 24–34.

Labrum, clypeus and inner orbits on lower half of face covered with a very fine, dense, decumbent, shining, silvery pubescence, most noticeable on clypeus; rest of head with fairly sparse, fine, white pilosity. Thorax and abdomen with fine, sparse, decumbent, white pubescence (not shining); thorax (especially pleura) and also propodeum with fine white pilosity (sparser than on head); last tergite margined by short, stout, light ferruginous bristles. Punctuation everywhere exceedingly fine and close except on last tergite which is furnished with large, sparse punctures separated by wide shining interstices.

Mandibles lightly built, with a small tooth some way back from the apex. Clypeus somewhat flattened in the middle in front (best seen in profile) but depressed area not as clearly delimited as in female. Inner margins of eyes parallel (Fig. 9). Face carinate below between antennae. Flagellum with flagellomere 1 about one-half longer than 2; flagellomeres 5–11 excavate below and therefore spined or laterally produced, each flagellomere up to and including the penultimate progressively more strongly excavate; ultimate flagellomere (11) markedly curved, almost angularly bent below.

Fore tarsi (Fig. 10) with first four tarsomeres dilated; first tarsomere with a row of about 10 short, stiff, flattened spines inserted below between midline of joint and margin.

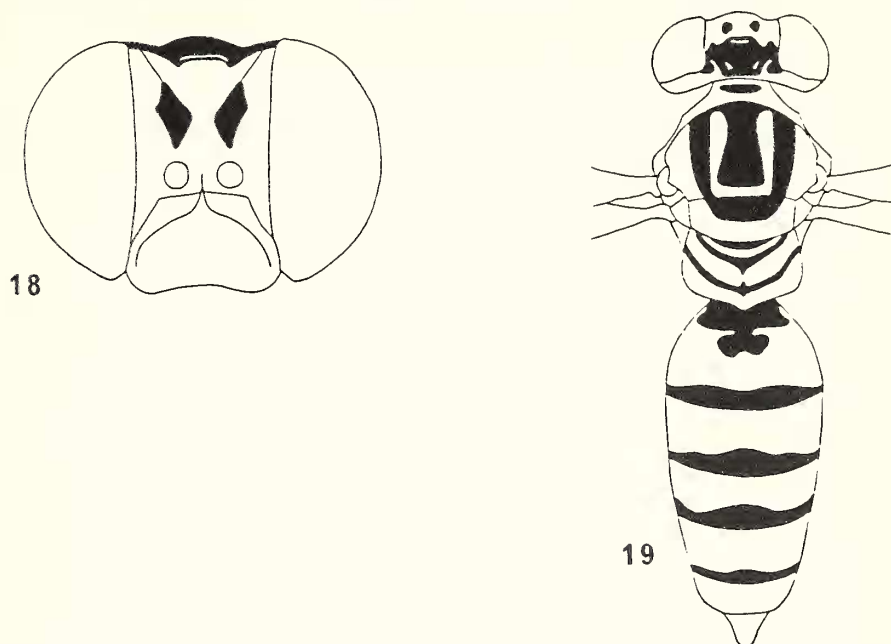
Middle femora finely serrate over most of the posterior margin; middle tarsi modified; hind femora shallowly but distinctly emarginate below (Fig. 11).

Tergite 7 and its lateral lobes as figured (Figs 12 and 13). Sternite 2 (Fig. 14) with a raised, arcuate, median longitudinal carina arising some distance from the anterior margin and ending some distance from the hind margin in a rounded slightly overhanging projection. Sternite 6 (Figs 13 and 15) with a narrow, acutely pointed, posteriorly raised triangular platform; sternite 7 narrow and apically pointed with a strong median and two feeble lateral carinae.

Genitalia (Figs 16 and 17) with gonostyles bifurcate; upper ramus long and narrow; lower ramus well sclerotised, untwisted, short and broad, rounded apically, situated below upper ramus and except for outside edges not visible from above.

FEMALE (Figs 18 and 19)

Black; mandibles excepting their apices, labrum, clypeus, face (excepting for a pair of elongate spots above antennal sockets and a transverse band between eyes at level of ocelli), bands margining posterior orbits and meeting in the middle behind ocellar area, entire scape, flagellum (except for upper surface which narrowly brownish), posterior margin and sides of pronotum, wide lateral bands and a very well developed U-shaped mark on mesonotum, wide bands margining scutellum and metanotum, entire pleura and thoracic sternites, propodeum (except for a basal band margining metonotum and a narrow V-shaped band the point of which is on the declivity above the oriface and the arms of which end above the spiracles where they are downwardly produced), broad transverse bands on tergites 1–4 (that of tergite 1 containing a pair of oval black spots sometimes fused together and then either narrowly or broadly connected to basal black band, those of tergites 2 and 3 sometimes with small transverse black



Figs 18–19. *Bembix zinni* sp. nov. ♀: 18 head (frontal view); 19, head, thorax and abdomen (dorsal view). Fig. 18 is $\times 12$; Fig. 19 is $\times 6$

spots), entire tergite 5, sternites 1–4 and distal two-thirds of 5, whole of legs (except small spot on hind coxae, pulvilli), various shades of yellow.

Tergite 6 and sometimes apex of sternite 5 light ferruginous.

Vestiture and puncturation very similar to that of male; shining silvery pubescence most noticeable on depressed region of clypeus.

Clypeus distinctly flattened in the middle in front with depressed area clearly delimited (Fig. 18). Other than for secondary sexual characters, very similar to the male.

Length of body 11,5–14 mm (Allotype 13,5 mm).

MATERIAL EXAMINED: Cape Province: Merweville Distr., Jan.–Feb. 1947 (H. Zinn) Holotype ♂, Allotype ♀, 2 Paratype ♂♂, 5 Paratype ♀♀; Merweville, Laingsburg Distr., i.1959 (H. Zinn), 2 Paratype ♀♀.

Holotype, Allotype, 1 Paratype ♂, 4 Paratype ♀♀ in South African Museum; 1 Paratype ♂, 3 Paratype ♀♀ in Albany Museum.

ETYMOLOGY: The name, in the genitive singular, is formed from the name of the collector of the present material. The author has pleasure in naming this species for the late Mr Humphrey Zinn, for 41 years on the technical staff of the South African Museum, whose enthusiastic collecting over the years, not only on official expeditions of which he was a member but also during his vacations, provided much valuable material so important for the study of our fauna.

Bembix karoensis sp. nov.

MALE (Figs 20–24)

Black; mandibles excepting their apices, labrum, clypeus, face up to level of anterior ocellus (excepting for a pair of spots below ocellus), posterior orbits, scapes, pedicels, first flagellomeres below, posterior margin and lower half of sides of pronotum, pronotal tubercles (except for a central streak), prosternum bordering coxae, anterior portion of mesopleura and vertical bar below each tegula, mesosternum, two spots on metapleura below, spot of variable size on sides of propodeum and another anterior to each spiracle, legs (except for black markings on middle and hind coxae, streaks on upper side of femora and to a lesser extent of tibiae, lamellae of fore-tarsi and distal half on fifth tarsomeres and claws of all legs), most of sternites 1–3 and transverse posterior bands widening at sides on sternites 4 and 5, *lemon-yellow*.

Narrow band bordering sides and hind margin of scutellum, narrow apical band on metanotum, median transverse bands widening at sides on tergites 1–6 (those on 2–5 sometimes narrowly interrupted at midline and that on 6 sometimes not attaining lateral margins), *yellowish-white*.

Flagellomeres (with exception of first) light ferruginous below, dark above. Wings hyaline, veins light brown, subcosta as far as its junction with basal vein darker, almost black proximally.

Length of body 15–16,5 mm, length of wings 9–10 mm, hamuli 25–30.

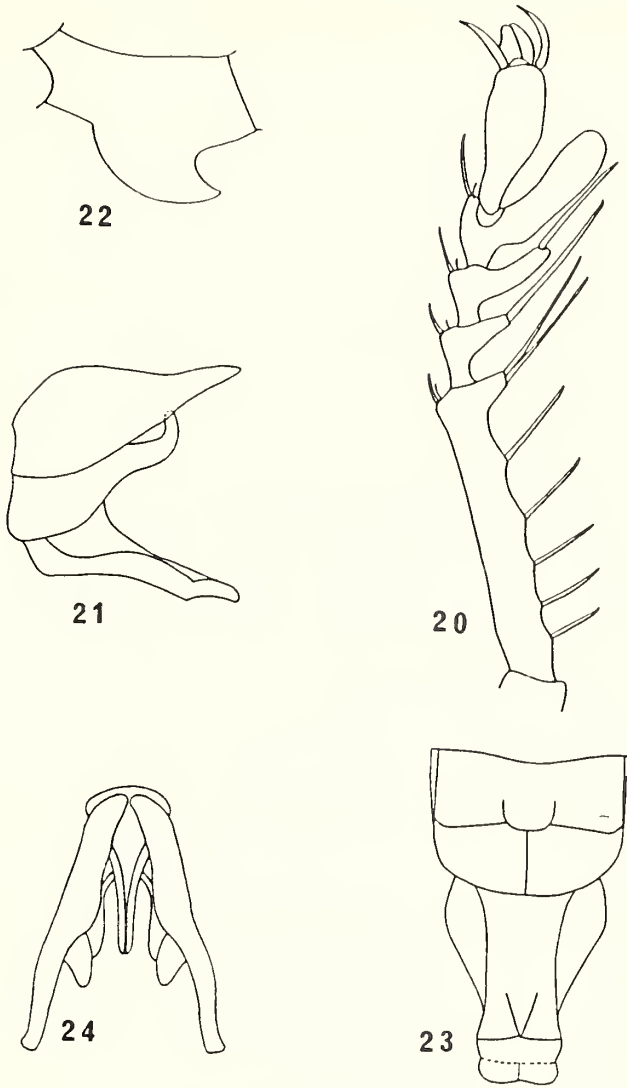
Labrum basolaterally, clypeus in greater part and inner orbits on lower half of face covered with a very fine, dense, decumbent, shining, silvery pubescence, most noticeable on clypeus; rest of head, entire thorax and propodeum and first abdominal segment with fine, long, erect, white pilosity; rest of abdomen with shorter, semi-erect, white pilosity; sixth tergite postero-laterally in addition with a number of dark, short, stout, apically-pointed setae. Puncturation everywhere very fine and close except on last tergite where somewhat larger and sparse with wide shining interstices.

Mandibles lightly built, with a small tooth some way back from the apex. Clypeus only slightly less than twice as wide as long, moderately but evenly convex. Inner margins of eyes parallel; face at level of antennal sockets 1,2 times wider than width of one eye, carinate below between antennal sockets. Scape robust, only twice as long (excluding radicle) as maximum width. Flagellum with flagellomere 1 as long as 2, 3 and half of 4 together; flagellomeres 5–11 modified, 5–7 each with a transverse ridge below near base (those on 6 and 7 spine-like in side view) and excavate below distal to ridges, 8–11 excavate below along their entire length.

Fore tarsi (Fig. 20) modified; first tarsomere weakly expanded laterally at insertion of spines, more strongly so distally; second to fourth tarsomeres progressively more strongly expanded laterally; third and fourth narrowly lamellate; fifth somewhat swollen.

Middle femora with fine serrations distally on posterior margin variously developed; middle tarsi modified.

Tergite 7 and its lateral lobes as figured (Fig. 21). Sternite 2 (Fig. 22) with a raised, arcuate and posteriorly pointed median longitudinal carina; sternite 6 (Fig. 23) with a small, bluntly rounded, posteriorly raised platform about as wide as long; sternite 7 (Fig. 23) wide, lamelliform and truncate apically, swollen transversely subapically, with two parallel longitudinal carinae bounding sides and raised distally into triangular pointed lamellae bordering ends of transverse subapical swelling, with a triangular raised portion between parallel carinae and having its apex at middle of transverse swelling.



Figs 20–24. *Bembix karoensis* sp. nov. ♂: 20, right fore tarsus; 21, abdominal segment 7 (lateral view); 22, sternite 2 (lateral view, profile, anterior to left of figure); 23, sternites 6 and 7 (ventral view); 24, genitalia (dorsal view). Fig. 20 is $\times 25$; Figs 21–24 are $\times 12$.

Genitalia (Fig. 24) with gonostyles bifurcate; upper ramus long and more or less straight; the pair of upper rami subparallel; lower ramus weakly sclerotized, lamelliform.

FEMALE

Black; mandibles excepting their apices, labrum, clypeus, face up to level of anterior ocellus (excepting for a pair of spots below ocellus), posterior orbits, scapes, pedicels, first flagellomeres below, posterior margin and whole of sides of pronotum, pronotal tubercles (except for narrow markings centrally), whole of prosternum, broad wedge-shaped markings bordering tegulae on each side of mesonotum and a pair of narrow longitudinal streaks on disc of same, bands on sides and posterior margins of scutellum and metanotum and band bordering disc of propodeum and extending some way down declivity medially, entire mesopleura, mesosternum and metapleura (except sutures), entire sides of propodeum (except small region behind spiracles), legs except for black streaks on upper sides of femora, the pulvilli and claws), broad median transverse bands widening abruptly laterally on tergites 1–5, large apical spot on tergite 6, entire sternites 1 and 2 and all but basal portion of sternites 3–5, *lemon yellow*.

Flagellum and wings coloured as in male. Vestiture and puncturation likewise similar to that of male.

Length of body 14–15 mm (Allotype 15 mm), length of wings 8,3 mm, hamuli 28–29.

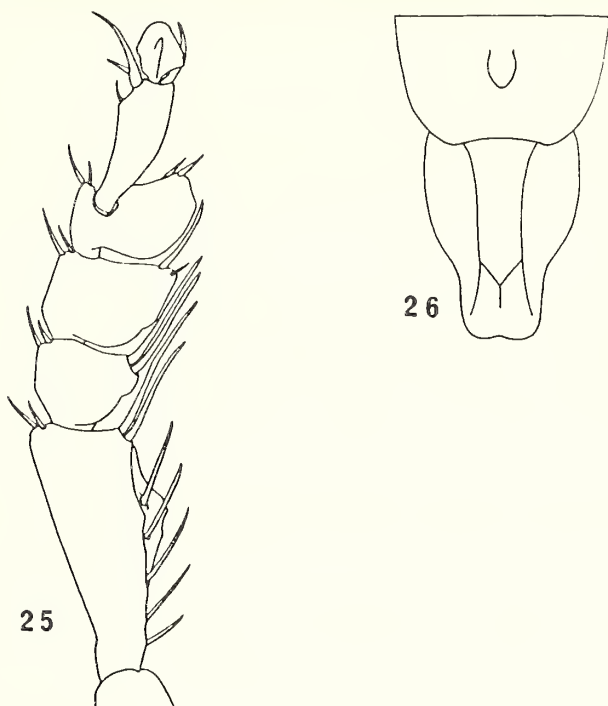
MATERIAL EXAMINED: Cape Province: Merweville, Laingsburg Distri., i.[19]59 (H. Zinn) Holotype ♂, Allotype ♀ (South African Museum); Merweville Distr., ii.1948 (H. Zinn) Paratype ♂ (South African Museum); Dikbome, Merweville, Koup, x.1952 (Mus. Exped.) 2 Paratype ♂♂ (Albany Museum). South West Africa (Namibia): 18 km from Ariamsvlei on road to Aroab, 14.v.1973 (C.F. Jacot-Guillarmod) Paratype ♀ (Albany Museum); Barby 26, Bethanie, SE2516DC, 2–7.x.1972 (no collector) (F9244) Paratype ♂ (State Museum, Windhoek).

ETYMOLOGY: The name, an adjective, is derived from the geographical name, Karoo, and refers to the provenance of the described specimens.

B. karoensis is allied to *B. cameronis* Handlirsch to which it bears a close superficial resemblance with respect to size, coloration and general facies. The following combination of characters is shared: in both sexes a wide face with parallel inner orbits; in the females short wings, and lateral carinae on tergite 6 enclosing a flattened pygideal area; in the males dilated fore-tarsomeres, postero-distally dentate middle femora, modified middle tarsomeres, a raised longitudinal carina on sternite 2, a raised platform on sternite 6, and two longitudinal carinae on a wide sternite 7.

The males may be distinguished by the form of the dilations of the fore-tarsomeres (in *cameronis* tarsomeres 1–4 are all more or less evenly expanded, the lamellate parts of 2, 3 and 4 being subquadrate) (Fig. 25), by the form of the raised platform on sternite 6 (in *cameronis* much smaller, narrower than long) (Fig. 26), by the details of the structure of sternite 7 (in *cameronis* the transverse subapical swelling and the lamelliform ends of the lateral carinae are absent) (Fig. 26), and by the form of the upper ramus of the bifurcate gonostyle (in *cameronis* wider and inwardly curved).

Females may be distinguished by means of the relative proportions of the scapes and of flagellomeres 1 and 2. In *karoensis* the length of flagellomere 1 is twice that of flagellomere 2 and the combined length of these two flagellomeres exceeds the length of the scape (without radicle) by a factor of almost 1,2. In *cameronis*, on the other hand, the length of flagellomere 1 is less than twice that of flagellomere 2 and the combined length of these two flagellomeres equals that of the scape (without radicle).



Figs 25–26. *Bembix cameronis* Handlirsch ♂: 25, right fore tarsus; 26, sternites 6 and 7 (ventral view). (Fig. 25 is $\times 25$; Fig. 26 is $\times 12$).

***Bembix ulula* Arnold and *Bembix junodi* Arnold**

Bembix ulula Arnold, 1929: 330, figs 2, 2a, 2b, Pl. VI, figs 3 and 43, ♂, ♀; Arnold, 1935: 503.

Bembix Junodi Arnold, 1929: 379, figs 42, 42a, 42b, 42c, Pl. VI, fig. 45, ♂, **syn. nov.**

Bembix ulula Arnold was described from four localities in Rhodesia (now Zimbabwe): Victoria Falls, Gwaai, Sawmills and Springvale. An additional specimen was recorded by Arnold (1935) from Kuke Pan, Kalahari (in Botswana).

Bembix junodi Arnold, described from Lourenço Marques (now Maputo) in Moçambique, is known only from the type material (2♂♂) in the Transvaal Museum.

According to the descriptions and also Arnold's key to species, the outstanding difference between the males of the two species is to be found in the structure of the genitalia, which indeed look very different in the figures (2b and 42c). Examination, however, of the two specimens of *junodi* showed that the gonostyles (Arnold's "outer paramera") of the holotype (which had the genitalia extracted but still attached) were damaged distally, whereas what little could be seen of the tips of these structures in the paratype suggested that they were quite different from the figure (42c) but similar to the bifurcate gonostyles of *ulula*. Subsequent partial extraction of the genitalia of the paratype confirmed that that specimen could indeed be as-

signed to *ulula*, as could also the holotype which differs from the paratype only with respect to the state of repair of the gonostyles. It appears that the gonostyles of the holotype were damaged already at the time of description and that the figure (42c), as indeed the species *junodi*, is based upon these broken gonostyles the missing apices of which were incorrectly "reconstructed" in the drawing.

It is significant that of all the species seen by Arnold (1929) *junodi* was the only one which he was unable to assign to any of Handlirsch's species groups; furthermore, that, despite this, *junodi* and *ulula* run down together to the same couplet in his key. The differences given by Arnold for the relative proportions of the flagellomeres in the two species are illusory.

Bembix ulula Arnold has position precedence and *B. junodi* Arnold must therefore sink into synonymy.

MATERIAL EXAMINED: Cape Province: Kalahari Gemsbok Park, Nossob Camp, 24–27.iv.1973 (M. W. Mansell) (Malaise trap) ♀ (Albany Museum). Natal: Manguzi River nr. Maputa, Zululand], xi–xii–1945 (H. Bell Marley) ♂ (Albany Museum). Rhodesia (now Zimbabwe): Gwaai, 16.i.1927 (G. Arnold) Holotype ♂ of *B. ulula*, 2♀♀ (South African Museum ex National Museum Bulawayo 1981); Gwaai, 16.i.1927 (Rhodesia Museum) Allotype ♀ of *B. ulula* (South African Museum ex National Museum Bulawayo 1981); Insuza River, 24.xii.1939 (Nat. Museum of S. Rhodesia) ♂ (South African Museum ex National Museum Bulawayo 1981); Lupane, xii.1938 (National Museum of Rhodesia) ♂ (South African Museum ex National Museum Bulawayo 1981); Lupane, xii.1938 (National Museum of Rhodesia) ♀ (Albany Museum); Sawmills, 22–27.xii.1923 (R. H. R. Stevenson) ♀ (Albany Museum); Sawmills, 22.ii.1925 (Rhod. Museum) ♀ (South African Museum ex National Museum Bulawayo 1981); Sawmills, 4.ii.1926 (R. H. R. Stevenson) ♀ (South African Museum ex National Museum Bulawayo 1981); W. Matetsi, iv.1934 (R. H. R. Stevenson) 2♀♀ (South African Museum ex National Museum Bulawayo 1981). Moçambique: Lour[enco] Marques, Jan. (no year) (Rev H. A. Junod) Holotype ♂ of *B. junodi* (Type No. H–193) (Transvaal Museum); Lour[enco] Marques, (no date) (Rev H. A. Junod) Paratype ♂ of *B. junodi* (Paratype No H–194) (Transvaal Museum).

BIOLOGICAL NOTES

Nesting observations were made during the course of a survey of the aculeate wasps of a karroid area to the WNW of Grahamstown (33° 19' S, 26° 32' E) in the Eastern Cape Province. Nesting sites of *B. albofasciata* Smith, *B. cameronis* Handlirsch, *B. melanopa* Handlirsch and *B. sibilans* Handlirsch were located on the farm Hilton, 18 km WNW of Grahamstown. An additional nesting site of *B. albofasciata* and *B. sibilans* was located on the farm Slaaikraal, 9 km WNW of Grahamstown. A detailed account of various aspects of the ecology of Hilton has been given previously (Gess, 1981: 3–9). The nesting substrate in both localities is light-coloured, fine-grained sand derived from the weathering of Witteberg quartzite. In addition some observations of two littoral species, *B. arnoldi* Arnold and *B. fraudulenta* Arnold, were made at Boknes, 47 km S of Grahamstown, and at Riet River Mouth, 57 km ESE of Grahamstown. The beaches at these two localities are relatively wide, sandy and backed by low dunes colonized by pioneer plants. All species were represented by a few individuals only.

In addition prey records, pertaining to these and to other species, derived from specimens in the Albany Museum are included.

Biological observations, unless otherwise attributed, are jointly those of the author, S. K. Gess and D. W. Gess with the very able assistance of H. W. Gess and R. W. Gess. All the prey listed were determined by the author and either constitute previously unpublished records or amplifications of those published in Gess (1981).

***Bembix albofasciata* Smith**

Nesting sites

At Hilton *B. albofasciata* nests in loose sand on a gently sloping roadside bank and in horizontal to gently sloping loose sand outside the rim of a sandpit dug in an alluvial deposit of sand deposited on the floodplain of a seasonal tributary of the New Year's River. At Slaaikraal the nesting site is similarly on the fringe of a sandpit, in this locality, situated at the foot of a hill slope in the rain shadow.

Flight period

Males and females were collected in the vicinity of the nesting sites from late November to late February and nesting was recorded from early December to late February.

Plants visited by adult wasps

No observations were made of plant visiting at Hilton or Slaaikraal, however, two males and 21 females were collected on flowering *Foeniculum vulgare* Mill. (Umbelliferae) and two females on flowering lucerne in Belmont Valley which extends SE from Grahamstown.

Description of the nest (Fig. 27)

Fourteen nests were excavated. All were single-celled. The nest consists of a short trench leading to a subcircular entrance hole from which extends a burrow, shallow at first and then

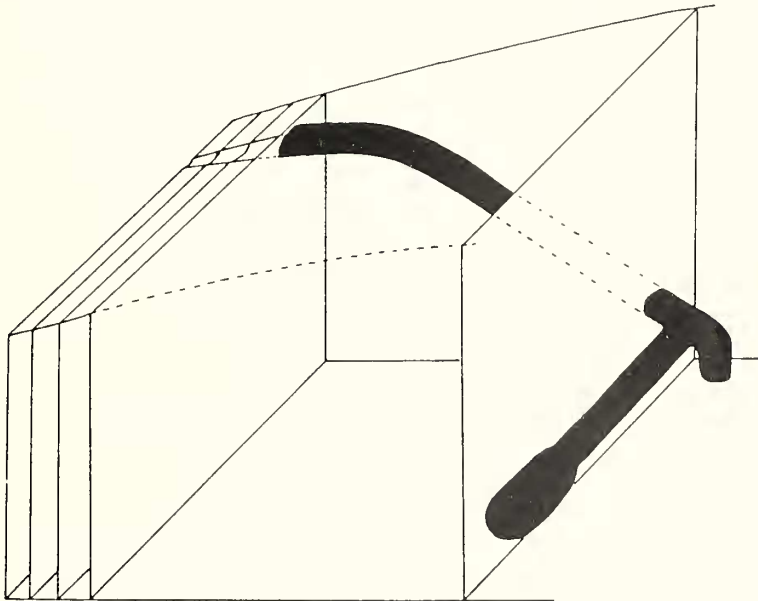


Fig. 27. *Bembix albofasciata* Smith: Plan of nest C from Hilton, 10.i.1975. ($\times 0,5$)

turning downwards more steeply to reach an average depth of 95 mm (range 75–135 mm; sample 13) at which level there is most typically a change in direction of from 45–90°. The burrow terminates in a cell at an average distance of 56 mm (range 42–73 mm; sample 8) from the angle. The diameter of the main burrow is an average of 9 mm (range 7–10 mm; sample 14) and of the cell an average of 14 mm (range 13–18 mm; sample 9). In six of the 14 nests excavated there was a distinct spur at the change in direction of the burrow. The spur continued in the same direction as the initial shaft but was directed sharply downwards.

Method of construction of the nest and provisioning

Like its congeners, *B. albofasciata* is a 'raker'. In digging the fore-tarsi are bent towards the mid-line of the body and are moved repeatedly backwards and forwards, each back stroke throwing back a load of sand which passes beneath the upheld abdomen to behind the body. There was no evidence of sand being raked away from the burrow entrance, in fact the burrow is characterized by the presence of a tumulus of excavated sand at the outer end of the entrance trench.

Provisioning is progressive. During the period of provisioning a temporary closure is maintained whilst the female is away from the nest and the approach to the cell is kept loosely filled with sand.

Prey

Nest A: Hilton, 8.xii.1974.		
Tabanidae	<i>Chrysops obliquefasciatus</i> Macq.	1♂
Asilidae	? <i>Xenomys</i> sp.	1♂
Muscidae	<i>Musca lusoria</i> Weid.	1♂
Nest B. Hilton, 8.xii.1974		
Stratiomyidae	?Genus and species	1♂
Asilidae	<i>Synolcus</i> sp.	1♀
Conopidae	?Genus and species	1
Calliphoridae	?Genus and species	3
Nest C: Hilton, 10.i.1975		
Stratiomyidae	?Genus and species	1♂
Mydidae	<i>Nomoneura caffra</i> Hesse	1♀
Asilidae	<i>Synolcus</i> sp.	1♀
	<i>Stenopogon dilutus</i> (Walker)	1♀
	?Genus and species	1
Sarcophagidae	<i>Sarcophaga</i> sp.	2
Nest D (77/78/141): Hilton, 2.i.1978		
Stratiomyidae	?Genus and species	1♂
Calliphoridae	<i>Chrysomya ?putoria</i> (Wied.)	1
Nest E (77/78/205): Hilton, 18.i.1978		
Tachinidae	?Genus and species	1
Nest F (77/78/224): Hilton, 7.ii.1978		
Bombyliidae	<i>Lomatia pictipennis</i> (Wied.)	1
Calliphoridae	?Genus and species	1

GESS: THREE NEW SPECIES OF S. A. BEMPIX (HYMENOPTERA: SPHECIDAE: NYSSONINAE)

Nest G (82/83/62): Slaaikraal, 2.xii.1982		
Bombyliidae	<i>Exoprosopa</i> sp.	1
Nest H (82/83/102): Hilton, 9.xii.1982		
Asilidae	?Genus and species (<i>Neolopho-</i> <i>notus</i> group)	1 ♂
Bombyliidae	<i>Geron</i> sp.	1 ♂
	? <i>Geron</i> sp.	1 ♀
Muscidae	<i>Musca</i> sp.	3 ♂ ♂ (+2?)
Calliphoridae	?Genus and species	3 ♀ ♀,
		4 ♂ ♂ (+2?)
	?Genus and species	1 ♀
Tachinidae	?Genus and species	1 ♀, 1 ♂
Nest I (82/83/104): Hilton, 9.xii.1982		
Asilidae	<i>Synolcus</i> sp.	1 ♂
	<i>Acnephalum andreoides</i> (Wied.)	1 ♂
Bombyliidae	<i>Systoechus</i> sp.	2 ♂ ♂, 1 ♀, 1
	<i>Henica longirostris</i> (Wied.)	1 ♀
	<i>Exoprosopa</i> sp.	1
	<i>Villa</i> ? <i>vitripennis</i> (Loew)	3
Calliphoridae	?Genus and species	2 (+?)
Tachinidae	?Genus and species	1 (+?)

Females captured at nest entrance with prey:

Hilton, 8.xii.1974, Calliphoridae, ?genus and species, ♂; Hilton, 10.i.1978, Bombyliidae, *Exoprosopa* sp., 1; Hilton, 9.ii.1978, Bombyliidae, *Lomatia pulchriceps* Loew, ♂; Hilton, 9.ii.1978, Bombyliidae, *Lomatia pictipennis* (Wied.), ♂; Hilton, 21.ii.1983 Calliphoridae, ?genus and species, ♀.

Additional records derived from specimens in the Albany Museum:

Lesotho, Mamathes, 18.xii.1949 (C. Jacot-Guillarmod), Tachinidae, ?genus and species, ♀; Lesotho, Mamathes, 26.ii.1944 (C. Jacot-Guillarmod), Asilidae, *Neolaparus* sp., ♀; Lesotho, Mamathes, 14.ii.1950 (C. Jacot-Guillarmod), Syrphidae, *Eristalis tenax* (L.), ♀; O.F.S., Chicago, Lindley Dist., 17–28.i.1968 (D. J. Brothers), Calliphoridae, *Chrysomya marginalis* Wied., ♂; O.F.S., Chicago, Lindley Dist., 17–28.i.1968 (D. J. Brothers), Sarcophagidae, *Sarcophaga* sp., 1.

***Bembix arnoldi* Arnold**

Plants visited by adult wasps

Males and females of *B. arnoldi* were collected in January, 1984 on flowers of *Hydrophyllax carnosa* (Hochst.) Sond. (Rubiaceae) growing on low fore-dunes at Boknes.

Nesting

No provisioned nests have been found, however, individuals have been observed digging burrows in level sand on the seaward side of the fore-dunes at Boknes. Whether these were for nesting or for sheltering is not known.

Hunting and prey capture

Some observations were made by D. W. Gess on hunting and prey capture by *B. arnoldi* at Boknes on 25.i.1984. Scattered piles of ocean wrack are deposited along the tide line. Those which have been exposed for some hours are attended by large numbers of small flies. A female *B. arnoldi* was observed flying low over the seaweed and patrolling a distance of about 10 m. Every now and then she came to rest on the sand for a few seconds which she spent grooming. On one occasion the wasp swooped down and picked up a small piece of debris, apparently mistakenly as it was dropped. Eventually a small fly was captured. The wasp swooped down, grabbed the fly and stung it in mid-air whilst hovering about 15 cm above the ground. The wasp reached underneath the fly with its abdomen and stung it from below. Once stinging had been completed the wasp prepared to fly away but was captured.

The prey was a small muscid, *Adersia oestroides* Karsch (Tabanidae) was commonly present in the vicinity of the wrack but was ignored by *B. arnoldi*.

***Bembix cameronis* Handlirsch**

Nesting site

At Hilton a nest of *B. cameronis* was found within the sandpit in the level floor of the pit.

Flight period

At Hilton males have been collected from early November to early December and females from early December to early January. The single nest was excavated in mid-December and a female was captured with prey in January.

Plants visited by adult wasps

At Hilton males and females have been collected visiting flowers of Compositae—*Senecio* sp. (4♀ ♀ and 3♂ ♂), *Athanasia* sp. (♂), *Lasiospermum bipinnatum* (Th.) Druce (♀).

Description of the nest

The single nest consisted of an evenly sloping burrow 7 mm in diameter ending in a horizontally aligned cell at a depth of 90 mm. The diameter of the cell was 11 mm. The total length of the burrow including the cell was 210 mm. There was no indication of a lateral branch or of a spur.

Prey

Female captured with prey:

Hilton, 10.i.1984, Bombyliidae, *Systoechus* sp., ♀.

Additional record derived from specimen in the Albany Museum:

Lesotho, Bokong P.O., 26.xii.1946 (A. Jacot-Guillarmod), Bombyliidae, *Systoechus* sp., ♂.

***Bembix capensis* Lapeletier**

Prey

Female captured with prey:

Hilton, 2.xii.1977, Tachinidae, ?genus and species, 1.

Additional record derived from specimen in the Albany Museum:

Transvaal, Pretoria North sandpits, 25.10.1947 (C. Jacot-Guillarmod), Sarcophagidae, *Sarcophaga* sp., ♀.

***Bembix capicola* Handlirsch**

Prey

Records derived from specimens in the Albany Museum:

Lesotho, Mamathes, i.1940 (C. Jacot-Guillarmod), Syrphidae, ?genus and species, ♂;
Lesotho, Mamathes, i.1940 (C. Jacot-Guillarmod), Tachinidae, ?genus and species, ♀; Lesotho,
Mamathes, i.1940 (C. Jacot-Guillarmod), Calliphoridae, ?genus and species, ♂.

Record derived from specimen in the South African Museum:

Lesotho, Mamathes, i.1940 (C. Jacot-Guillarmod), Muscidae, ?genus and species, 1.

***Bembix flavocincta* Turner**

Prey

Records derived from specimens in the Albany Museum:

Malawi, Domira Bay, Lake Nyassa (alt.1760), no date, (J. B. Casey), Bombyliidae, ?genus and species, ♀; Malawi, Domira Bay, Lake Nyassa (alt.1760), no date, (J. B. Casey), Sarcophagidae, *Sarcophaga* sp., ♀.

***Bembix fraudulenta* Arnold**

Plants visited by adult wasps

Males and females were collected on flowers of *Hydrophylax carnosus* (Hochst.) Sond. (Rubiaceae) growing on low fore-dunes at Boknes (13♂♂ and 5♀♀), of *Ipomoea brasiliensis* (L.) Sweet (Convolvulaceae) growing on low fore-dunes at Riet River Mouth (4♂♂), of *Gazania* sp. (Compositae) growing on fore-dunes at Boknes (♀), and of a white-flowered "mesem" (Mesembrianthemaceae) at Kenton-on-Sea (45 km SSE of Grahamstown) (♀).

Prey

Record derived from specimen in the Albany Museum:

Natal, Umhlanga Rocks, 1.i.1955 (E. McC.Callan), Mydidae, *Nomoneuroides natalensis* Hesse (♂).

***Bembix melanopa* Handlirsch**

Nesting sites

At Hilton *B. melanopa* nests in the sloping banks of the sandpit.

Flight period

Males and females were collected at Hilton from mid-November to mid-February and nesting was recorded in mid-November and mid-January.

Plants visited by adult wasps

No observations were made of plant visiting at Hilton, however, two females were collected on flowering *Foeniculum vulgare* Mill. (Umbelliferae) 5 km N of Alexandria on the road to Salem.

Description of the nest

Three nests were excavated. Two were single-celled and the third had not reached the stage of cell construction. The nest burrows, 9 mm in diameter, sloped evenly downwards for a

distance of 215 and 240 mm before changing in direction and after a further 20 mm terminated in an upwardly directed cell greater in diameter than the shaft. In one of the nests a spur was present shortly before the change in direction of the burrow.

Method of construction of the nest

Whether or not a tumulus accumulated below the nest entrance was dependant upon the steepness of the slope in which the nest was excavated. Sand was not raked away from the entrance.

By comparison the method of excavation of a sheltering burrow observed at Boknes is of interest. The burrow was excavated in sloping sand below a carpark. Digging was performed in the manner described for *B. albofasciata*, however, no tumulus was allowed to develop, the excavated sand being frequently raked away. After a time sand was no longer removed from the burrow but allowed to accumulate just within the mouth of the burrow until it was completely occluded and concealed.

Prey

Nest J (82/83/12): Hilton, 16.xi.1982.

Muscidae	<i>Musca</i> sp.	4
Calliphoridae	?Genus and species	1♂
Sarcophagidae	<i>Sarcophaga</i> sp.	1
Tachinidae	?Genus and species	1

Nest K (83/84/72): Hilton, 10.i.1984.

Syrphidae	<i>Eristalinus taeniops</i> (Wied.)	2♀♀, 4♂♂
	?Genus and species	1♀, 1♂
Calliphoridae	?Genus and species	3♀♀ (+1?)
	?Genus and species	1?

Additional records derived from specimens in the Albany Museum:

Cape Province, Fort Beaufort, 20.i.1960 (C. Jacot-Guillarmod), Muscidae, *Musca* sp., ♂;
Cape Province, Natures Valley, 28.xii.1966 (A. Jacot-Guillarmod), Tabanidae, *Philoliche* (*Phara*) *flavipes* Macq., ♀.

***Bembix moebii* Handlirsch**

Record derived from specimen in the Albany Museum:

Transvaal, Sewefontein, 15 miles E of Middelburg, 5.xii.1973 (A. L. Dyce), "Observed catching tabanids feeding on cattle".

***Bembix sibilans* Handlirsch**

Nesting sites

B. sibilans was found nesting in relatively horizontal ground at Hilton and on the side of a sandpit at Slaaikraal.

Flight period

At Hilton males were collected from November to February and females from December to March. Nesting was recorded in early December at both Hilton and Slaaikraal.

Plants visited by adult wasps

At Hilton females were captured visiting flowers of *Phyllopodium cuneifolium* Benth. (Scrophulariaceae) (1 ♀) and *Anchusa capensis* Th. (Boraginaceae) (1 ♀).

Description of the nest

Two nests were excavated. Both were single-celled. Both consisted of an evenly sloping burrow 8 mm in diameter ending in a cell. In the nest in the sloping bank the cell was in the same plane as the shaft and in the nest in level ground the cell was positioned horizontally. In both instances the diameter of the cell was 14 mm. The lengths of the shafts were 80 and 130 mm respectively. There was no indication of a spur in either nest.

Prey

Nest L (82/83/63) Slaaikraal, 2.xii.1984.

Tabanidae	<i>Amanella minor</i> Oldroyd	1♂
Bombyliidae	<i>Lomatia oreoica</i> Hesse	1♂
	<i>Exoprosopa</i> sp. A	17
	<i>Exoprosopa</i> sp. B	3
	<i>Exoprosopa</i> sp. C	1

Nest M (82/83/70) Hilton, 3.xii.1982.

Nemestrinidae	<i>Atriadops vespertilio</i> (Loew)	4♂♂
Bombyliidae	<i>Bombylius delicatus</i> Wied.	1♀
	? <i>Systoechus</i> sp.	2
	<i>Exoprosopa</i> sp.	4
	<i>Villa vitripennis</i> (Loew)	1
	?Genus and species	1
	?Genus and species	1
	?Genus and species	1
Calliphoridae	?Genus and species	2
	?Genus and species	3
Sarcophagidae	<i>Sarcophaga</i> sp.	1
Tachinidae	?Genus and species	1♀

Additional record derived from specimen in the Albany Museum:

Transvaal, Mooiplaas, Spekboom River, 30 miles N of Lydenburg, 26.xi.1973 (A. L. Dyce), "observed catching tabanids".

REVIEW OF THE NATURE OF THE PREY OF THE GENUS BEMBIX WITH PARTICULAR REFERENCE TO AFROTROPICAL SPECIES

The genus *Bembix* is a modern genus of nearly world wide distribution. Knowledge of the ethology of the genus was until recently limited very largely to that of species occurring in the northern hemisphere. These species, at least all of those studied, prey exclusively upon Diptera. A few fragmentary and in some instances not very well authenticated records of some southern hemisphere species hunting non-dipterous prey were consequently treated with considerable caution.

This situation has in recent years been strikingly modified. Following approximately twelve months of field work in Australia, Evans and Matthews (1973 and 1975) showed that the Australian *Bembix* exhibit unusual radiation with respect to prey. Of the 22 species studied in the field about one-third were found to prey upon insects of orders other than Diptera. Three species took only bees (chiefly social, stingless bees of the genus *Trigona*), one species took only wasps (Thynninae), one took only ant lions (Neuroptera) and one only damselflies (Odonata). Two species in transition with respect to prey preference took both flies and other insects, one bees and wasps and the other damselflies.

The exciting findings with respect to the Australian fauna show that, whereas it remains true that the vast majority of *Bembix* species prey upon Diptera, it would be wrong simply to assume that any given species of unknown ethology preys upon flies. It is therefore not only valid but necessary to record the prey preference of each and every species for even if the preference is only for flies it will at least have been established with certainty that it is not for any other group. It seems that this approach is particularly appropriate with respect to the Afrotropical species which, despite their large number (Bohart and Menke, 1976, list about 90) are poorly known ethologically and may consequently provide some surprises though most probably not upon the Australian scale.

One or possibly two Afrotropical species have indeed been found to use not Diptera but adult Lepidoptera as prey. Carpenter (1917) recorded observing an unidentified *Bembix* species hunting and capturing an hesperiid butterfly near Tabora in central Tanganyika (now Tanzania). Of greater value are the observations of Stevenson in Southern Rhodesia (now Zimbabwe) reported by Benson (1934). These concerned *Bembix regnata* Parker (= *B. speciosa* Arnold) which was recorded as regularly catching butterflies, "usually species of *Terias* (Pieridae) and small HesperIIDae, but sometimes Nymphalidae, for example once *Charaxes etheocles* Cram., ♂, and once *Pyrameis cardui* L., and also once a Hesperid of middle-size, *Abantis zambeziaca* Westw.". Some of Stevenson's material (*Bembix* ♀♀ and prey), exhibited on 3 October 1934 at a meeting of the Royal Entomological Society of London, is in the collection of the British Museum (Natural History) and was examined there by the present author in 1984. Label data, not given by Benson (1934) are: Westwood near Matetsi, Southern Rhodesia, 30.3.19[34], R. H. R. Stevenson.

Information regarding the prey of twelve (possibly thirteen) Afrotropical *Bembix* species has been published (Benson, 1934; Bequaert, 1932; Carpenter, 1917 and 1920; Cuthbertson, 1933 and 1939; Gess, 1981; Ulyett and De Vries, 1940). Prey records for a further six species are presented in the present paper as are additional records pertaining to four species for which prey is already known. All available records pertaining to the total of 18 (possibly 19) species are indicated in Table 1, the prey being identified to family only.

The subject of prey selection by *Bembix* species has been dealt with by Evans (1957: 11-12, 211; 1966: 357). The present information pertaining to the Afrotropical species, both that presented here as new and that given by other authors (see Table 1), is in accord with Evans' generalizations based upon the Diptera-hunting North American and Eurasian species.

All the species for which fair numbers of prey species have been collected and for which it is consequently possible to form an assessment show little selection as to the type of fly utilized. Prey belonging to a wide range of families is taken (Table 1), the qualifying criterion apparently being one of size. No Nematocera have been recorded as prey. Among the Brachycera, the Tabanidae and Bombyliidae are most often represented whereas, among the Cyclor-

TABLE 1.

Prey (identified to family only) of Afrotropical species of *Bembix*.

<i>Bembix</i> species	Prey		Reference
<i>B. albofasciata</i> Smith	DIPTERA	Stratiomyidae Tabanidae Mydidae Asilidae Bombyliidae Syrphidae Conopidae Muscidae Calliphoridae Sarcophagidae Tachinidae	Gess (1981); Present paper Gess (1981); Present paper Present paper Gess (1981); Present paper Gess (1981); Present paper Present paper Gess (1981); Present paper Gess (1981); Present paper Gess (1981); Present paper Present paper Gess (1981); Present paper
<i>B. arnoldi</i> Arnold	DIPTERA	Muscidae	Present paper
<i>B. bequaerti dira</i> Arnold	DIPTERA	Tabanidae unspecified*	Bequaert (1932) Bequaert (1932)
<i>B. braunsii</i> Handlirsch	DIPTERA	Tabanidae unspecified*	Bequaert (1932) Bequaert (1932)
<i>B. cameronis</i> Handlirsch	DIPTERA	Bombyliidae	Present paper
<i>B. capensis</i> Lepelletier	DIPTERA	Tabanidae Glossinidae Calliphoridae Sarcophagidae Tachinidae unspecified	Carpenter (1920) Carpenter (1920) Ullyett & De Vries (1940) Present paper Gess (1981); Present paper Carpenter (1920); Ullyett & De Vries (1940)
<i>B. capicola</i> Handlirsch	DIPTERA	Syrphidae Muscidae Calliphoridae Tachinidae unspecified	Present paper Present paper Ullyett & De Vries (1940); Present paper Present paper Ullyett & De Vries (1940)
<i>B. flavocincta</i> Turner	DIPTERA	Bombyliidae Sarcophagidae	Present paper Present paper
<i>B. forcipata</i> Handlirsch	DIPTERA	Glossinidae unspecified	Carpenter (1920) Carpenter (1920)
<i>B. fraudulenta</i> Arnold	DIPTERA	Mydidae	Present paper

<i>Bembix</i> species	Prey		Reference
<i>B. fuscipennis</i> Lepelletier	DIPTERA	Tabanidae Bombyliidae Syrphidae Muscidae Calliphoridae Sarcophagidae Tachinidae	Cuthbertson (1939) Cuthbertson (1939) Cuthbertson (1939) Cuthbertson (1939) Cuthbertson (1939) Cuthbertson (1939) Cuthbertson (1939)
<i>B. massaica</i> Cameron	DIPTERA	Calliphoridae	Cuthbertson (1933)
<i>B. melanopa</i> Handlirsch	DIPTERA	Tabanidae Bombyliidae Syrphidae Muscidae Calliphoridae Sarcophagidae Tachinidae unspecified	Cuthbertson (1939); Present paper Cuthbertson (1939) Cuthbertson (1939); Present paper Cuthbertson (1939); Gess (1981); Present paper Cuthbertson (1939); Ulyett & De Vries (1940); Present paper Cuthbertson (1939); Present paper Cuthbertson (1939); Present paper Ulyett & De Vries (1940)
<i>B. moebii</i> Handlirsch	DIPTERA	Tabanidae	Present paper
<i>B. olivata</i> Dahlbom	DIPTERA	Calliphoridae unspecified	Ulyett & De Vries (1940) Ulyett & De Vries (1940)
<i>B. sp. (?regnata</i> Parker)	LEPIDOPTERA	Hesperiidae	Carpenter (1917)
<i>B. regnata</i> Parker	LEPIDOPTERA	Pieridae Hesperiidae Nymphalidae	Benson (1934) Benson (1934) Benson (1934)
<i>B. sibilans</i> Handlirsch	DIPTERA	Tabanidae Nemestrinidae Bombyliidae Calliphoridae Sarcophagidae Tachinidae	Present paper Present paper Present paper Present paper Present paper Present paper
<i>B. ugandensis</i> Turner	DIPTERA	unspecified	Carpenter (1920)

*Prey of *B. bequaerti dira* and *B. braunsii* other than Tabanidae are noted jointly as "Bombyliidae, Syrphidae, Stratiomyidae, Muscoidea, etc."

rhapsa, the Syrphidae and the muscoid families Muscidae, Calliphoridae, Sarcophagidae and Tachinidae are predominant.

It is clear that the complex of flies captured by a provisioning female *Bembix* is in the first instance circumscribed by the composition of the dipterous fauna of her nesting area. The composition of the prey is further determined by the species assemblages occurring at certain sources of flies (e.g. flowers, carcasses, dung, warm blooded animals, aggregations on vegetation of newly emerged flies) discovered and then repeatedly revisited by an individual hunting

female. Furthermore, as indicated by Evans, the composition of the prey may reflect innate differences in hunting behaviour amongst various *Bembix* species.

Among the presently listed species, *B. olivata* Dahlbom in the Cape Province was recorded by Ullyett and De Vries (1940) to "have been seen to frequent the vicinity of sheep during periods of blowfly [*Lucilia sericata* (Meigen)] abundance and to search around the sheep itself for flies". Blood-sucking tsetse flies, *Glossina palpalis* (Robineau-Desvoidy) in Uganda were reported by Carpenter (1920) to have been hunted on himself by *B. forcipata* Handlirsch. Similarly, *B. moebii* Handlirsch in the Transvaal was observed by Dyce catching Tabanidae feeding on cattle. On the other hand, speculation upon the origin of Tabanidae of both sexes recovered from the nests of *B. bequaerti dira* Arnold at Stanleyville (now Kisangani in Zaire) and listed by Bequaert (1932: 3) led Oldroyd (1954: 35-37) to suggest that the wasps were collecting their prey from the forest canopy or from intermediate levels.

From a consideration of at least the brachycerous component of its prey assemblage *B. albofasciata* at Hilton and Slaaikraal would appear to hunt close to the ground in the general vicinity of its nesting areas. Thus the tabanid *Chrysops obliquefasciata* Macq., the mydid *Nomoneura caffra* Hesse, the asilids *Stenopogon dilutus* (Walker), *Acnephalum andrenoides* (Wied.) and *Synolcus* sp., and the bombyliids *Lomatia pictipennis* (Wied.), *Henica longirostris* (Wied.) and species of *Systoechus*, *Exoprosopa* and *Villa* are well known to the author as common members of the community of insects associated with the sandy areas in which occur also the nests of *B. albofasciata*. It is only in these sandy areas that these flies of differing behaviours may be found together: all are to be found resting upon the ground or flying about low over it. All but the mydid occur in the open; the latter favours light mottled shade under clumps of *Acacia karoo* fringing the bare sandy areas.

Evans (1966: 357) has stated that "whether or not the accumulation of long lists of prey records is worth while is a moot question". Besides establishing whether the prey is dipterous, as is most often the case, it would certainly appear that such lists have little intrinsic value if what is sought from them is evidence of prey selection linked to prey systematics. On the other hand such lists, particularly where they relate to specific localities in which the ecology of the prey is known, are of use in determining patterns of hunting behaviour. Furthermore, where two or more *Bembix* species nest within the same area, they would indicate whether resource partitioning with regard to prey occurs.

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